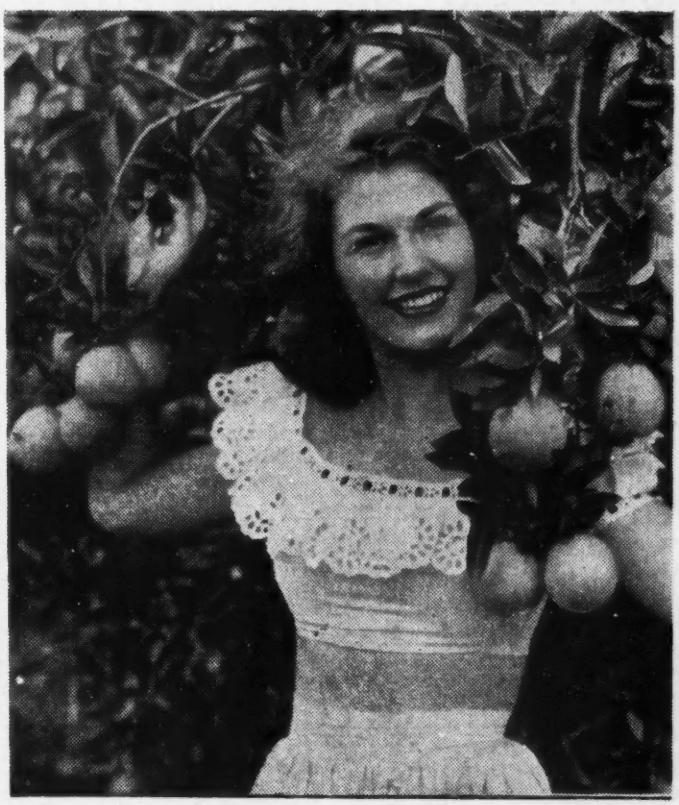
Citrus Industry



MISS SELMA ROCKER
Reigning Queen of The Florida Orange Festival

The Specific Effects Of Certain Temperatures On Stored Fruits, Vegetables And Flower Bulbs...

ERSTON V. MILLER

Reprinted from The Scientific Monthly, February 1946, Vol. LXII, pages 173-186.

For many years it has been the custom to hold certain fresh fruits and vegetables in cold storage for the purpose of preventing spoilage. It is the general consensus that the low temperatures in the storage rooms serve to arrest or retard the biological processes that bring about senescence and decay, and for the most part this belief is correct. However, there are certain physiological processes that not only are able to continue at these low temperatures but even appear to be accelerated. Sometimes a certain temperature or narrow range of temperatures appears very specific in producing certain effects on fruits vegetables tubers, and bulbs.

It often happens for example, that when citrus fruits are held at 32 degrees F. for four to six weeks there develops a physiological disorder known as "watery breakdown." Although it gives the fruits the appearance of having been frozen, carefully controlled experiments have demonstrated that this disorder may be produced by low temperatures that are still above the freezing point of the fruits. Pitting (pox, storage spot) is another low-temperature disorder of citrus fruits It is characterized by shallow, pocklike depressions in the rind, which become discolored in the advanced stages. Temperatures most conducive to pitting are 32 degrees for lemons, 36 degrees to 40 degrees for oranges, and 40 degrees for grapefruit.

Still other, more or less superfical, rind blemishes of citrus fruits are "scald" on oranges and grapefruit and "peteca" and "red blotch" of lemons. "Membranous stain" of lemons, a darkening of the membranes between the segments, has been found much worse at 36 degress and 40 degrees F. than at 32 degrees, 50 degrees, and 60 degrees.

Tropical fruits are still more sensitive to low temperatures than are the subtropical citrus fruits. If papayas are held for only 5 days at 45 degrees F. or lower, they become chilled, and the treatment so upsets their metabolic processes that they will not ripen properly when removed to higher temperatures. Experiments have shown that certain chemical processes that accompany normal ripening, such as inversion of sucrose, are arrested by exposure to low temperatures and are not resumed when the fruit is brought back to room temperatures. In like manner avocados, pineapples, and bananas experience a physiological breakdown when held too long at low temperatures. The result is usually a darkening of some of the tissues when the fruit is removed to higher temperatures. It is not necessary to keep very low in the temperature scale to produce deleterious effects in bananas. Green fruits, if held at temperatures below 56 degrees for four or five days, will subsequently fail to ripen properly in the ripening rooms. Bananas that have been chilled after ripening will develop a dull-brown color when later exposed to higher temperatures, and are very susceptible to handling marks, the slightest bruising causing discoloration. Darkened bananas sometimes appear on the fruit stands after the merchant or the deliveryman has been caught unawares by sudden and unexpected cold weather and the consumer has been known to hold bananas in the refrigerator long enough to have them darken when brought out into the room.

Tropical vegetables may suffer from low-temperature injuries just

(Continued on page 10)

Thirteenth Annual Citrus Grower's-Institute

The Thirteenth Annual Citrus Growers Institute will be held at Camp McQuarrie, near Astor Park, Lake County, Monday to Friday, September 2-6, 1946. The Institute is sponsored by the Lake County Horticultural Society, directed by the Florida Agricultural Extension Service

Previous meetings of the Institute have been largely attended and have proven of much interest to citrus growers. The forthcoming meeting promises to be of quite as much interest and value as those which have preceeded it. Papers and talks covering a wide range of subjects of vital concern to citrus growers will be given by men in position to speak with authority.

Camp facilities are available for all families of those who attend. Persons intending to remain over night should bring pillows, sheets and blankets. There is no charge for sleeping accommodations as long as they last. Reservations should be made to R. E. Norris, county agent, Tavares. Meals will be available at 75 cents for each meal, or $7.50 for each person including Monday supper to Friday breakfast. Checks should be made payable to Citrus Growers Institute.

Talks and papers which will be of especial interest to citrus growers are listed below:

Tuesday, September 3

Today's program will be featured by talks from Staff Members of the U. S. Subtropical Fruit Station at Orlando, Dr. F. E. Gardner, presiding.

9:00 "Pollination Experiments with the Hamlin Orange"—Dr. P. C. Reece.

"Trunk and Root Diseases of Citrus"—Dr. J. F. L. Childs.

"Influence of Type of Bloom on Crop Set in Oranges, Grapefruit and Tangerines"—Dr. P. C. Reece.

"Amount and Type of Bloom in Relation to Nitrogen Application" —Dr. F. E. Gardner.

1:30 "Breeding of Citrus for New and Improved Varieties"—E. M. Savage.

Seasonal Changes in Soils, Acid, Palatability of Varieties of Citrus" —Dr. P. L. Harding.

"Factors Contributing to Green Mold Infection and Decay of Oranges'— G. A. Meckstroth.

"Decay Control of Citrus"—Dr. J. R. Winston.

Wednesday, September 4

This morning's program will feature some of the economic phases of the citrus industry. E. F. DeBusk, presiding.

9:00 "The Future for Fresh Citrus." Dr. J. Wayne Reitz, Economic Counsel, United Growers & Shippers Association.

(Continued on page 9)

The Citrus Industry
EXCLUSIVE SPECIALIZED CITRUS PUBLICATION
Issued Monthly
Representative of every interest
Representing no special interest

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The Effect Of Application Of ....

Calcium And Magnesium Upon Absorption Of Potassium By Citrus

B. R. FUDGE
Associate Chemist Citrus Experiment Station, at Meeting Florida State Horticultural Society

During the past ten years the fertilizer mixtures applied to citrus groves have changed from the old type N-P-K formulas to those which have added calcium, magnesium and small quantities of the trace or minor elements. Quite generally this mixed fertilizer of garanteed analysis is supplemented with direct soil applications of dolomite or some other slightly basic magnesium bearing material. These changes in fertilizer practices have produced very favorable responses in tree condition and yield performance which may be attributed to the correction of several nutrient deficiencies. Very little attention has been given the effect of these added elements upon the absorption of nitrogen, phosphorus and potassium. These elements (N-P-K) have been carried over into the new fertilizer program with very little if any change or consideration of tree requirements.

The purpose of this discussion is to point out some effects which added calcium and magnesium have upon the absorption of potassium as measured by foilage and fruit analyses as well as some implications regarding crop production.

The importance and significance of mineral nurtient ion balance is apparent in the results thus far obtained on all of the plots at the Citrus Experiment Station. The interaction of calcium, potassium and magnesium is observed as a repressive effect on the cation (Ca, K or Mg) being increasingly absorbed upon the absorption of the other two; that is, as the absorption of one increases the other two decreases. For example, the curves in Figure 1 show the effects of increasing the rate of potash fertilization from zero to 16 units per ton upon the absorption of potassium, calcium and magnesium. The potassium content of the leaves increased as the amount of potassium in the fertilizer increased. Although calcium and magnesium were uniformly applied to all plots, it is quite apparent that less and less of these two elements were absorbed as the absorption of potassium increased. Furthermore, the sum total amount (Ca+K+Ng) of these elements absorbed decreased as the amount of potassium absorbed increased. Thus increased application and absorption of potassium repressed the absorption of calcium and magnesium. If the supply of available magnesium had been lower in these plots, it is conceivable that the highest rates of potash fertilization would have induced the symptoms of magnesium deficiency.

With higher levels of available calcium and magnesium in the soil, greater amounts of these two elements would have been absorbed and the absorption of potassium would have been lower at all rates of potash application. However, the slope of the curves would have remained essentially the same. The curves of Figure 2 serve to illustrate this point. In this experiment Block V absorption of potash at different rates of application has been determined at two different levels of calcium and magnesium fertilization.

In the fall of 1939 the old N-P-K fertilizer program which these plots had received for sixteen years was slightly altered for the purpose of making a comparison of the effects of calcium and magnesium upon the growth and production of Duncan grapefruit. The plots receiving 3.0, 5.0 and 10.0 percent K^2O fertilizer remained unchanged. Plot No. 6 which had re-

ceived 3.0 percent in the spring, 5.0 percent in the summer and 10.0 percent K_2O in the fall was changed to a check (0.0 percent K_2O) plot. Calcium and magnesium in the form of dolomite and water soluble magnesium were uniformly applied to a section of all plots at right angles to or across the potash plots. All of the plots received copper, zinc and manganese in the form of nutritional sprays or as fungicidal sprays for the control of melanose. Thus the principal difference in treatment within each potash plot, shown in Figure 2, was the absence of added calcium and magnesium in one section (broken line) and the addition of these two elements in the other section (solid line).

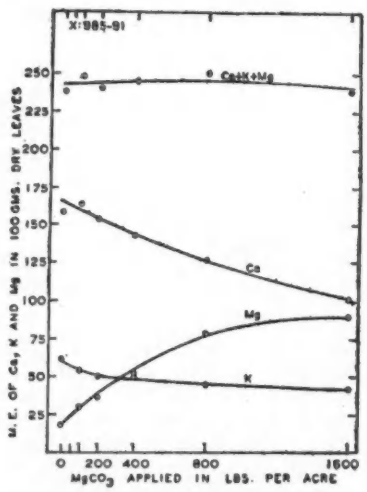


Figure 1. Graph showing the effect of different rates of application of muriate of potash upon the amount of potassium, calcium and magnesium in orange foilage.

The amount of potassium found in the leaves increased as the amount applied increased in both sections of the plots which agree with the results shown in Figure 1. However, the amount of potassium (K) absorbed at each rate of application was less where calcium and magnesium were added than where the supply of these elements was low (broken line). Likewise the applications of dolomite and water soluble magnesium resulted in greater absorption of calcium and magnesium and repressed the absorption of potassium. The foliage composition in the check plots (O K_2O) showed very high calcium which was due to the extremely low supply of potash in the soil even in the section (broken line) where the pH is low and the only supply of calcium was superphosphate, the calcium content of the foliage was greater than that found when additional calcium had been applied in the presence of only 3.0 percent K_2O (solid line). The curves of Figure 2 illustrate the effect of the new fertilizer program in which calcium and magnesium are used for controlling pH and correcting magnesium deficiency has upon the absorption of potassium. The Duncan grapefruit trees are in much better physical condition and have produced more fruit where calcium and magnesium have been added.

As further evidence of the repressive effect of applications of calcium and magnesium upon potassium absorption, the averaged results of several sets of samples are shown in Table 1. The averaged results of 1935 and 1936 were obtained before a check plot was set up in 1939. The 3 and 10 percent K_2O duplicate plots have received this treatment for more than twenty years and may be used for comparison. The 1942 results were obtained from sections of the plots receiving additions of dolomite and water soluble magnesium. The absorption of potassium is 20 to 25 milliequivalents lower where calcium and magnesium were added which is approximately a 30 percent reduction. The amount of potassium (61.1ME.) absorbed from the application of fertilizer containing 3 units K_2O on soil low in calcium and magnesium is about equal to the amount (59.6M.E.) absorbed from the application of 10 units of K_2O on soil to which calcium and magnesium had been added. The lower absorption of potassium is off-set by higher absorption of 10 units of K_2O on soil to which calcium and magnesium had been added. The lower absorption of potassium is off-set by higher absorption of calcium and magneisum.

From these foliage analyses, one may conclude that the old fertilizer program with high potash, low calcium and deficient magnesium gave inefficient utilization of nutrients and low crop production. Also, potassium was being absorbed in "Luxury consumption"; that is, considerably in excess of an efficient requirement. On the other hand, the new fertilizer program in which additions of calcium and especially magnesium are made have so increased tree vigor and crop yield that the apparent luxury consumption of potassium is eliminated where fertilizer containing 5.0 units of K_2O is applied. With lesser amounts of potash in the fertilizer, the trees show indications of potash hunger.

The amount of these elements, especially potassium and magnesium removed in the fruit crop are important from the standpoint of crop requirement. The curves in Figure 3 show the milliequivaltnt composition of 100 grams of whole fruit dry matter. The amount of potassium found in the fruit increased as the rate of K_2O applied increased, while the amount of calcium found decreased. The amount of potassium in the fruit dry matter is of about the same magnitude as that found in the leaves. Calcium and magnesium are much lower in fruit as compared with leaves. It is interesting to note that the fruit contained slightly more potassium where calcium and magnesium were applied which is the opposite of the results obtained from the leaves on the same trees (Figure 2). This may be due to the presence of a greater number of leaves in the proximity of each fruit resulting fram the correction of magnesium deficiency.

In order to determine the amount of potassium removed in the fruit, the total average yield per tree was computed for a four-year period, 1940-44. The average fresh fruit yields per tree are shown in the graphs of Figure 4 for each potash treatment with and without the additions of calcium and magnesium. The old fertilizer program which is represented by the open column produced the best average yield with 3.0 units of K_2O in the fertilizer. Whereas, in the presence of added calcium and magnesium, the 5.0 percent treatment produced the best average yield for the four-year period. With no exception, sections of the plots receiving added calcium and magnesium produced significantly greater yields of Duncan grapefruit.

Having determined the fruit composition (Figure 3) and the

total amount of fruit produced per tree (Figure 4), the amounts of potash applied to the soil and removed in the fruit during the four-year period was computed (Figure 5). Where no potash has been applied since the summer application in 1939, it is apparent that the fruit crop has continued to remove potassium from the trees. Although the potassium content of fruit (Figure 3) is low where no potash was applied, the average crop produced per tree over the four-year period was sufficient to remove 3.4 pounds K^2O with the old program (A) and about 6.0 pounds K^2O with calcium and magnesium added (B). With the exception of the results obtained where 3.0 units K^2O was applied, the graphs show that additions of calcium and magnesium to the soil has through greater crop yields (Figure 4) converted more potassium into fruit which, of course was removed from the tree.

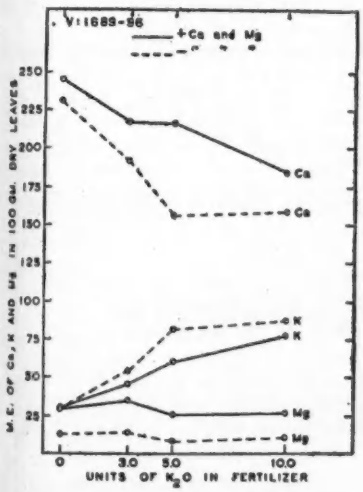


Figure 2. The effect of different rates of potash fertilization at two different levels of treatment with calcium and magnesium upon the composition of Duncan grapefruit foliage.

The results obtained with 5.0 units of K^2O in the fertilizer illustrate the difference in potassium requirement for crop production between the old N-P-K program with nutritional sprays (A) and the new N-P-K-Ca-Mg program with nutritional sprays (B). The amount applied in 5.0 percent fertilizer is approximately double the amount required for fruit production (A). The excess potash was either absorbed in luxury consumption or lost through leaching. Whereas, the amount removed in fruit where calcium and magnesium were applied (B) is almost equal to the amount of K^2O applied in the fertilizer. Thus it may be concluded that 5.0 units of K^2O applied three times a year is somewhat low for both vegetative growth and crop production of these grapefruit trees. The pounds of K^2O applied in 10.0 percent fertilizer was apparently in excess of the amount needed for growth and crop production. In fact it has been shown that 10 percent K^2O in the fertilizer applied three times each year repressed the absorption of calcium and magnesium which are known to be beneficial to growth and yield.

THE COMPOSITION OF DUNCAN GRAPEFRUIT FOLIAGE SHOWING CALCIUM, POTASSIUM AND MAGNESIUM IN MILLI-EQUIVALENTS PER 100 GRAMS OF DRY LEAVES.

UNITS K_2O IN FERT.		0	3	10
AVERAGE OF NINE ANALYSES IN 1935 AND 1936 (— Ca AND Mg)	Ca	- - -	123.5	98.4
	K	- - -	61.1	83.1
	Mg	- - -	13.5	13.2
	SUM	- - -	198.1	195.7
AVERAGE OF THREE ANALYSES IN 1942 (+ Ca AND Mg)	Ca	232.5	198.2	184.1
	K	35.1	42.2	59.6
	Mg	33.8	31.6	27.7
	SUM	301.4	272.0	272.4

These results show that grove practices and fertilizer programs which over a period of years will induce increased crop yields through the correction of a deficiency of one element may so increase the demand upon the supply of another element that it becomes deficient. The application of 8.0 percent K^2O

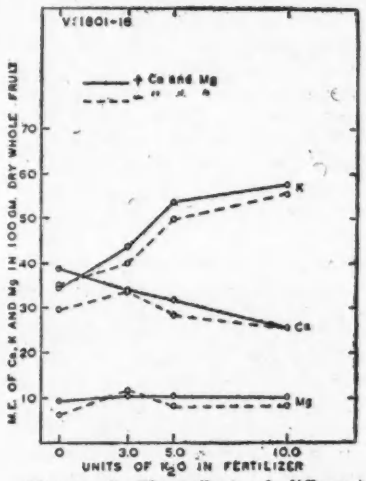


Figure 3. The effect of different rates of muriate of potash application at two levels of calcium and magnesium (A and B) upon Duncan fruit composition.

fertilizer three times per year in conjunction with 3.0 and sometimes 4.0 units of nitrogen or a total of 24 units in the fertilizer applied annually, appears to be quite adequate for growth and fruit requirements. Efficient rates of fertilizer application which produce optimum tree response are not necessarily large or uniform for any given element. These results indicate that cation balance in the soil supply of these three elements largely determine the degree of efficiency with which they are absorbed.

The amount of potash removed in the fruit produced on the check plots (O units K^2O) was surprisingly large. The amount in the soil has been very low since applications of potash were discontinued in 1939. It was thought that possibly considerable of this potash was coming from vegetative tissues other than leaves which did not show any difference in potassium content between the two check treatments

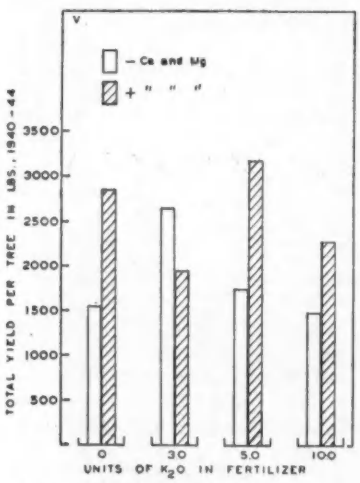


Figure 4. Effect of different rates of muriate of potash application at two levels of calcium and magnesium (A and B) upon yield of Duncan grapefruit.

(A and B, Figure 2). Accordingly, samples of trunk wood were collected and analyzed. The results are presented in Figure 6. The amounts of potash found were very small—about one tenth of the amount found in the fruit and foliage. Furthermore, the potassium content of trunk wood was slightly higher in those plots (B) which showed the greatest removal of potassium in the fruit. Thus it may be concluded that trunk wood analyses do not indicate that crop removal of potassium in the check plots can be explained as a depletion of a reserve of potassium within the

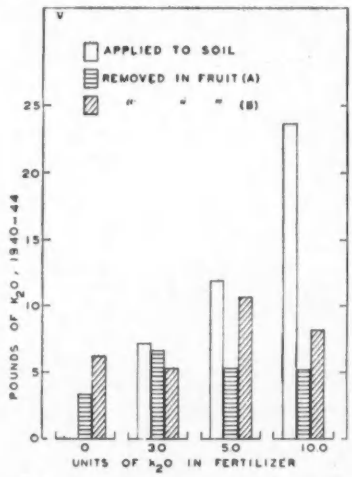


Figure 5. Graph showing total amount of Potash supplied per tree, and the total amount of Potash removed in fruit at two levels of calcium and magnesium (A and B) for a four-year period. 1940-44.

tree. The only other source of this potash is the soil.

Magnesium content of the trunk wood is very low, while calcium is relatively high. The trunk wood content of these two elements apparently is not affected by the various rates of potash fertilization. The trees in the check plots have produced for some time growth characteristics which appear to be potash deficiency. A significant amount of fruit drop occurs in the check plots throughout the summer, fall and winter months.

In conclusion it may be observed from these data that potassium absorption is repressed by additions of calcium and magnesium to the soil. These two elements are being added in the new and improved fertilizer program in considerable quantities. Magnesium is added for the correction of deficiency symptoms and supply maintenance requirements and calcium, usually in the form of dolomite, for the control of soil pH in the range of 5.5 to 6.0. In addition to these elements, applications of the minor or trace elements to the soil and in physiological sprays have resulted in a vigorous tree of abundant foliage with greater yielding capacity.

As a consequence of the greater yields, the requirements for potassium in crop production has been enhanced under conditions which

repress the relative absorption of this element. Results with the old fertilizer program (N-P-K) with nutritional sprays indicate luxury consumption of potash where grapefruit trees received 5.0 units of K_2O with 3.0 units of nitrogen in the fertilizer three times each year. The fruit produced occounted for only 44.7 percent of the potassium added in the fertilizer over a 4 year period. With the new fertilizer program (N-P-K-Ca-Mg-Mn-Cu Zn), the results with 5.0 units K_2O fertilizer under the same conditions showed that the crops of fruit produced accounted for 89.6 percent of the added potassium. Thus these results indicate that crop production is a major factor to consider in determining the potassium requirements. Due to the greater yields obtained with the present recommended fertilizer program. 5.0 units of K_2O in a fertilizer with 3.0 units of nitrogen applied three times each year apparently will not supply adequate potash for fruit production and vegetative growth on soils where leaching is an important factor. Over a period of years, the potash supply would probably become the "limiting factor" in crop production. The present recommendations call for the application of 8.0 units of K_2O with 3.0 and 4.0 units of nitrogen in fertilizers for summer and fall application. In the spring top dressers, the ration of N to K_2O are approximately 1.0 to 1.0 and the formulas usually analyze 8-0-8-6-1-/2 (N-P_2O_5-K_2O-MgO-MnO-CuO).

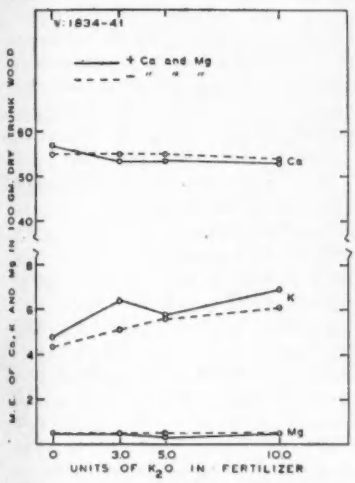


Figure 6. The effect of different rates of Potash application at two levels of calcium and magnesium (A and B) upon trunk wood composition.

THIRTEENTH ANNUAL CITRUS GROWER'S INSTITUTE

(Continued from page 9)

"How Much Citrus is Too Much" —Dr. J. L. Heid, Research Engineer, Florida Citrus Canners Cooperative, Lake Wales.

"Prices"—Dr. H. G. Hamilton, Professor of Marketing, Florida College of Agriculture.

1:30 "Possible National Legislation Affecting Citrus", Porter Taylor, Executive Secretary, Fresh Fruit and Vegetable Section, American Farm Bureau Federation, Washington.

"The Work of your Citrus Committee".— Robert C. Evans, Secretary, Florida Citrus Commission.

"The Place of the Express Shipper in the Citrus Industry" — S. Candler Coachman, Pioneer Pinellas County Express Shipper.

"What Becomes of Citrus Fertilizers"—Dr. O. C. Bryan, Technical Director, Soil Science Foundation.

Thursday, September 5

Today's Program will be featur-

(Continued on page 14)

THE SPECIFIC EFFECTS OF CERTAIN TEMPERATURES ON STORED FRUITS, VEGETABLES, AND FLOWER BULBS

(Continued from page 3)

as much as tropical fruits. Tomatoes are not ordinarily thought of as tropical because they are grown so extensively in temperate latitudes, yet their home is in the tropics. When wholesalers have attempted to hold too long at near 32 degrees the mature green tomatoes, or "green wraps," as they are commonly called, they have experienced rather disastrous results. These chilled tomatoes when removed to the ripening rooms, will ripen with a dull-yellow color, or they may decay before they ripen.

The average farm boy knows that the first frost is the signal to dig and cure sweet potatoes before they are injured by cold. Darkening and internal breakdown of the tissues occur in storage rooms also, when the temperature is below 40 degrees F. The susceptibility of sweet potatoes to low-temperature injury is reduced by proper curing. It is interesting to note that some success in prestorage "curing" of grapefruit has been reported, the processes for the two products being alike in principle, though not in details.

Even flower bulbs are subject to specific physiological effects of low temperatures. Several years ago in experiments in the U. S. Department of Agriculture, King Alfred narcissus bulbs were held during three successive storage periods. Temperatures during the first and third periods were in the range of 60 degrees to 90 degrees, but the middle period came within the range of cold storage, that is 32 degrees, 40 degrees, and 50 degrees. When bulbs were held at 40 degrees during the middle period of storage there subsequently developed more "blind," or nonblooming, bulbs than when they were held at 32 degrees or 50 degrees.

Here is an instance of the specific effect of one temperature, or perhaps a narrow range of temperatures. Another example, previously mentioned, was that of 36 degrees and 40 degrees in their relation to the development of membranous stain in lemons. Other effects of specific temperatures might be cited. Continuous storage at 50 degrees F. produces "pumpkinyellow" grapefruit, a good red color in Haden mangoes, and considerably more "blood" spots in the so-called blood oranges. These effects are not produced by temperatures some degrees higher or lower, or at least not so rapidly.

Examples can be cited in which certain desired physiological changes have been produced in fruits, vegetables, or flower bulbs by employing the proper temperatures in storage. Early season Bartlett pears from California arriving on the Eastern markets during July and August frequently fail to ripen with good color, flavor, and texture. Tests made by the U. S. Department of Agriculture showed that if these pears were ripened at 65 degrees to 70 degrees F. the flavor, color, and texture were satisfactory. Those ripened at 80-85 degrees F., the temperatures prevailing in the stores at the time, were of poor quality. Fall and winter varieties of pears likewise are of best quality when ripened at temperatures between 60 degrees and 70 degrees. Kiefer pears are usually considered to be of very low quality, and it is probable that this reputation has been based on the fact that they usually ripen during exposure to too high temperatures, at least in the South. Experiments have shown that when this variety of pear is ripened at 55-65 degrees the quality is greatly improved, although it never becomes the equal of such a variety as Bartlett.

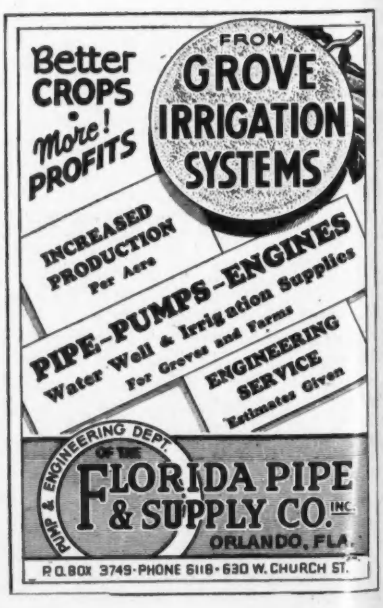
About 1928 or 1929 several restaurant operators and manufacturers of potato chips came to the U. S. Department of Agriculture with a problem. They stated that their French fried potatoes and potato chips were too dark for the customers and that the chips had an undesirable flavor. Now a dark color in a cooked product may be due to the caramelization of sugar, and the Government research men knew that there are certain storage temperatures at which sugar accumulates in Irish potatoes. This had been worked out many years ago at the University of Maryland when it was reported that Irish potatoes become sweeter if held in storage at 40 degrees F. or lower. A checkup revealed that the potatoes used for French "fries" and chips in this case had been previously stored at 32 degrees. Subsequent tests by the U. S. Bureau of Plant

AN EXPLANATION

Due to inability to secure paper, The Citrus Industry Magazine goes to its readers this month in greatly reduced form and printed upon paper of inferior quality.

Many interesting, important and instructive articles scheduled for this issus have been indefinitely postponed, until the paper stock situation clears up. Advertising has been held to the minimum, with preference given to regular clients. The editorial page is completely eliminated.

It is hoped that the paper situation by next issue may permit resumption of service in regular form and upon paper of the quality to which readers have been accustomed.



Industry in cooperation with the Bureau of Home Economics of the U. S. Depatment of Agriculture revealed that if potatoes were stored at 50-60 degrees F. for a while immediately before use they could be made into chips or French "fries" white in color and of good quality.

Examples may also be cited in which physiologists have utilized low temperatures for the purpose of stimulating seed production in certain vegetables. For instance, the production of flowers by sugar beet plants is objectionable when these plants are being grown for sugar, but when the object is the production of seed, the development of flowers is quite obviously necessary. The initiation of seedstalks and the flowering of biennial beets have been shown to be due to the cumulative effect of low-temperature exposure followed or accompanied by the effect of long photoperiods (duration of daylight). When research workers in the U. S. Department of Agriculture were breeding sugar beets and growing them in that part of the country where the length of day was insufficient to induce flowering, they overcame this by the use of cold storage. The tendency to "bolt," or produce seedstalks, was greatly stimulated by exposing the beets to low temperatures (33-38 degreesF.) before planting in the field. The treatment could be applied to the "mother" beet roots or to the germinating seeds.

Similar work has been done on onion bulbs. Storing them at 53-55 F. for four months prior to planting has caused the plants to blossom and ripen earlier and to yield more seed per acre.

The lay reader often objects to the manner in which scientific material is presented, pointing out that the impartial viewpoint usually leaves the reader with no definite answer to his questions. On occasions when this subject has been presented to groups or organizations, the speaker is invariably questioned as to the proper, rather than improper, temperatures at which various products should be stored. This information is available in publications of the State and Federal agricultural research agencies. For some of the fruits and vegetables mentioned above the U. S. Department of Agriculture makes the following recommendations for temperature of storage: Bananas, ripening, 62 degrees to 70 degrees, F., holding ripe fruit, 56 degrees to 65 degrees; grapefruit, 32 degrees where decay is a serious factor, or 45 degrees to 55 degrees if from other regions; lemons, 55 degrees to 58 degrees; oranges, 34 degrees to 39 degrees; pineapples, mature green, 50 degrees to 60 degrees, ripe, 40 degrees to 45 degrees; potatoes, no lower than 40 degrees for table or seed stock, unless the seed is to be kept longer than 3 to 5 months, in which case 36-38 degrees F. is recommended; sweet potatoes, 55 degrees to 60 degrees; tomatoes ripe, 40 degrees to 50 degrees, mature green, 55 degrees to 70 degrees.

Erston V. Miller
Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, ARA, USDA.

Florida Citrus Crop Valued At $160,000,000

Florida's citrus crop for the season just closed brought the growers the record sum of $160,000,000, which is $20,000,000 more than the total of the previous season's crop according to the report of Manager Robert C. Evans of the Florida Citrus Commission.

"The highlight of the 1945-46 season was the exceptionally large volume of citrus fruit marketed at record or near-record prices," Mr. Evans told the commission.

With a total volume of 86,250,000 boxes, canners and other by-products plants utilized approximately 42,000,000. In percentages, it is estimated that canners used 38.5 percent of the oranges; 69.2 percent of the grapefruit, and 11.9 percent of the tangerines. In 1943-44 canners utilized 40.5 percent of all citrus produced in Florida; in 1944-45, they utilized 45 percent; in 1945-46, just about one-half of the entire production went to canning and other processing plants.

"The trend in the volume of fruit utilized by processors follows the trend of increased production. It is generally believed that most of the increase in production in the future will be utilized by processors."

Evans said that 19,200,000 boxes of oranges, 22,150,000 boxes of grapefruit and 516,000 boxes of tangerines were processed, a total of 41,866,000 boxes, compared with the previous record of 31,341,000 boxes used in 1943-44.

The LYONIZER

Department

COMPILED BY THE LYONS FERTILIZER CO.

Reports Of Our Field Men . . .

POLK COUNTY
J. M. (Jim) Sample

Growing conditions in this section have been good during the past month. Rainfall has been generally adequate and tree growth and sizing of fruit is satisfactory. The orange corp is mostly very heavy; the tangerine crop is average to good; marsh seedless grapefruit is heavy, but seeded grapefruit is spotted, with some groves extremely light. There has been very little late bloom this summer, although a few tangerine blocks did bloom in early June and have set this late bloom fruit. The oil spraying period is about finished and sulphur sprays are next on the schedule as rust mites are active and numerous in most groves now. Present indications point to an early movement of fruit this season with a price range now being offered slightly higher than last year at this same time. There is considerable activity at the present time by fruit buyers and they are especially interested in common grapefruit and early oranges.

WEST CENTRAL FLORIDA
E. A. (Mac) McCartney

There is a good crop in my territory of early oranges, tangerines and seedlings as well as Marsh seedless grapefruit. Seeded grapefruit is light in spots but taken as a whole there should be a good average crop. There is very little June bloom of any kind. although grapefruit was a little spotty with bloom, We have had plenty of moisture. Growers are ending up their oil spray at this time, and groves are in excellent condition except where groves have been neglected as far as fertilization and spray programs are concerned. The Brooksville Citrus Growers Association had one of their best seasons. They are building a separate unit to take care of the tangerines and this will expedite the movement of fruit through the packing house. The Bell Fruit Company at Brooksville are making improvements and additions to their packing house. Sumter County had one of their best seasons with good returns on all vegetables. In Sumter County there is a great deal of interest shown in the development of improved pastures. Cattlemen in Sumter County recently pulled a big rodeo and barbecue in celebration of the progress and a large attendance was on hand for a well planned program.

HILLSBOROUGH & PINELLAS COUNTIES
C. S. (Charlie) Little

Citrus groves in this territory are in excellent condition. We have plenty of rain and all trees are beginning to put out a nice new growth, which now is much better than we thought we would have. Practically all groves in this section have been syrayed with oil and it appears that we did a good job of cleaning up our scale insects. Rust mites have been on a rampage and in many cases it was necessary for growers to dust for their control before the oil spray was applied. The orange crop in this territory is very good, it has grown on in fine shape that apparently will develop into excellent quality. Sizes are also good. Marsh seedless grapefruit is showing up well but there will be a light crop of common grapefruit. There has been some activity by fruit buyers and they are offering attractive prices.

NORTH CENTRAL FLORIDA
V. E. (Val) Bourland

We are going into the fall season with what looks to be one of the best crops of oranges that we have had in a long time. By best crop we mean that we have quality as well as quantity. Our tangerine crop is also good, so is Marsh seedless grapefruit, but there is going to be a light crop of the seedy varieties of grapefruit. There is plenty of activity by fruit buyers who are really trying to buy fruit. As a whole our groves are in excellent condition and growers have done an excellent job of keeping all insects and diseases under control. We have about completed our oil spray program and will now start with our sulphur sprays to keep rust mite under control. The past season was successful as far as profit received by the grower was concerned and most growers are extremely optomistic about the future of the citrus industry for years to come.

SOUTH POLK & HIGHLANDS COUNTY
R. L. (Bob) Pagdett

With out summer application of fertilizer behind us and most growers caught up with their spray program, we now have time to catch up on odd jobs that we have been putting off for a long time. We are doing lots of pruning in this section, and also we have replaced quite a few missing trees in our groves. Young groves are receiving particular attention. They are being fertilized at regular intervals and are being thoroughly cultivated in the immediate vicinity of the tree. Our groves are in excellent condition although at this time we could stand some additional rain which hasn't been excessive at any time this year. Our fruit crop is showing up well as far as both quality and quantity are concerned. There is a shortage of common grapefruit and while a number of growers were expecting to have some late bloom on this variety of fruit it never did make an appearance to any sizeable extent.

SOUTHWEST FLORIDA
Eaves Allison

We have had some late bloom on various varieties of fruit, but in the case of common grapefruit it was not sufficiently heavy to mean much of a crop on other varieties it was not needed. Regardless of this late bloom it is safe to say that we have a very normal crop of fruit throughout the territory. In many sections we have above the average crop on early oranges and seedlings. We have heard a number of complaints during the past year about quality of fertilizer produced by all of the Companies in the state, but if tree condition at the present time is any indication, then it is evident that the Fertilizer manufacturers have done a splendid job even under the most adverse conditions.

By cracky, we went and done it . . . took a little vacation trip up through Georgia, North Carolina and South Carolina . . . but was glad to git back home after bein' away for two or three weeks, but we're shore glad we went . . . 'cause in addition to enjoyin' the trip we found that they ain't no real danger of Florida reachin' the stage of overproduction in citrus fer a long time to come . . . all along our route we found Florida orange and grapefruit juice on sale and everywhere folks was really drinkin' Florida's vitamin rich citrus juices. At one little stand in South Carolina just over the border from North Carolina folks was standing in line to git a glass of citrus juice . . . and another operator told us that he sold more Florida citrus juices than all his other soft drinks put together . . . bet it won't be long 'til the same state of affairs exists all over the country. Nope Florida citrus growers ain't got nothin' to worry about yet so far as overproduction is concerned.

'nother thing that struck me was the fact that our citrus and vegetable crops today is so much better quality than they was a few years ago . . . and we realized all of a sudden that this improvement in quality jist didn't happen. Came about through settin' up uncompromisin' high standards and the careful followin' of scientific methods developed by experts who are leaders in their field. Fertilizer manufacturers has been at work, too, conducting intensive research so today the fertilizer you buy gives you larger yields and better crops than was the case a few years ago . . . Florida growers too, has a lot to be thankful for in the work being done by the State Experiment Station, and when everyone gits to usin' the information they can get from these various agencies Florida will supply the Nation with the best quality foods to be found anywhere in the world.

'cording to the Bureau of Agricultural Economics, Washington, D. C., it is expected that the production of small vegetable seeds in 1946 will be the smallest in six years . . . only about 14,600,000 pounds will be produced, they say, compared to 22 million pounds in 1945 and a 1940-44 average of over twenty million pounds . . . . large seeds like those of peas, beans, and corn is expected to show an increase from 206,000,000 to 252,000,000 pounds, with the most of the increase bein' in peas . . . we'd shore hate to have the job of countin' those seeds, but somehow or other the seed estimators usually come pretty close to forecastin' 'bout right.

Seems like with all the packin' houses bein' closed now that it would be wise for growers to take advantage of this unemployed help to git their odd jobs cleaned up before the beginnin' of the new fruit season . . . most groves could stand some prunin', young trees could be cultivated, ditch banks cleaned up, and fence rows hoed out . . along with a heap of other odd repair jobs . . . better think it over.

Uncle Bill

Fertilizer Ass'n Head Warns Production Not Up To Current Needs

American farmers' fertilizer requirements will not be relieved immediately in any way by the entrance of 15 U. S. Ordnance Plants into nitrogen fertilizer production, Maurice H. Lockwood, President of the National Fertilizer Association, declared in commenting on the War Department's recent announcement.

"Production by these plants is 'to meet the urgent needs of U. S. occupied areas' ", said Lockwood, "and the gov:rnment's plans to 'borrow' supplies from commercial producers will, in fact, cause some temporary inconvenience in this country."

"While the War Department's action is a welcome overall aid at a time of unusual world demand," NFA's head stated, "present benefits to the American farmer cannot be expected. Nevertheless the industry backs the move, having expressed its approval at an April 18th meeting of the U.S.D.A. Fertilizer industry Advisory Committee.

"The War Department has asked to 'borrow' fertilizer from existing world production, and our industry will 'lend' all that can be spared. I am confident that all Americans, and particularly our farmers, will display intelligent unselfishness in supplies with less fortunate peoples abroad. The peak of our annual domestic demand has now passed and we are assured that the Government will return in kind the borrowed supplies—in time to meet seasonal requirements in this country.

"The War Department's move", Lockwood said, "will be of inestimable help in feeding the hungry in other lands; it will give assistance to our domestic fertilizer industry, valiantly striving to meet unprecedented demands for their products at home and abroad; and in the long run, by reducing the amount of commercial production sent abroad, will help the American farmer to secure more of the fertilizer he needs."

Lockwood expressed the belief, however, that every precaution should be taken to assure that, when the emergency is over, the plants are either reconverted to other uses, or are sold to private fertilizer producers. "A sound economic system," he declared, "cannot tolerate the permanent invasion of the functions of private business by the government."

THIRTEENTH ANNUAL CITRUS GROWER'S - INSTITUTE

(Continued from page 9)

ed by talks from the Staff of the Citrus Experiment Station at Lake Alfred, Dr. A. F. Camp, presiding.

9:00 "Trends in Spray Schedules for Florida Citrus."—W. L. Thompson.

"The Efficiency of Grove Spraying from a Coverage Standpoint" —Dr. J. B. Redd.

"Progress Report on Studies on Parasites and Predators of Scale Insects".—Dr. J. T. Griffiths.

"Report on Citrus Decline Studies" —Dr. R. F. Suit.

1:30 p. m. "Relation of Foliage and Fruit Analysis to the Fertilizer Requirements of Citrus" —Dr. B. R. Fudge.

"Relation of Wetting Resistance in Citrus Soils to the Efficiency of Irrigation on Sandy Soils."—Dr. V. C. Jamison.

"The Status of the Citrus Decay Control Problem." — Dr. B. F. Hopkins.

"Drainage and Irrigation Problems on the East Coast".— Dr. T. W. Young.

Friday, September 6

Institute Staff

B. T. Nettle, Extension District Agent, Institute Director.

R. E. Norris, Lake County Agricultural Agent, Institute Manager.

Mrs. Lucie K. Miller, Lake County Home Demonstration Agent, Institute Hostess.

H. H. Hethcox Umatilla, Institute Registrar.

Al. H. Whitomre, Secretary, Florida Citrus Production Credit Association, Publicity Director.

Victor Larsen, City of Leesburg Recreation Director, Director of Recreation.

Musical Treat, Louis Murraro (of Groveland) and his Accordion